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인공지능연구원
POSTECH Institute of Artificial Intelligence

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Computer Vision

Dahyun, Kim

Computer Vision Lab

PIAI Research Department

- 1일차 : OpenCV Basic / Object Detection
- 2일차 : Object Detection / Facial Recognition
- 3일차 : Facial Recognition / Image Segmentation / Quiz (30분)

- **TF Quiz : 10문제**
- 실습 코드 : **2문제**
- 서술형 : **1문제**
- 시험범위 : 실습 교육 내용 **(이론 X)**

CV Lab Recommendation

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- 반 이론 반 실습 : 구체적인 내용들은 관련 용어 검색을 통해 공부
- 동작 관련 오류 : 각 반 조교에게 손들고 해결 요청 (A-김지호 B-김호연 C-이수민)
- 오류 해결이 오래 걸릴 경우 : 우선 교육 내용에 집중 후 놓친 부분은 각 반 조교에게 도움 요청
- Object Detection/Segmentation 학습의 경우 너무 긴 시간이 걸림 : Appendix 참조

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Computer Vision With OpenCV

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OpenCV

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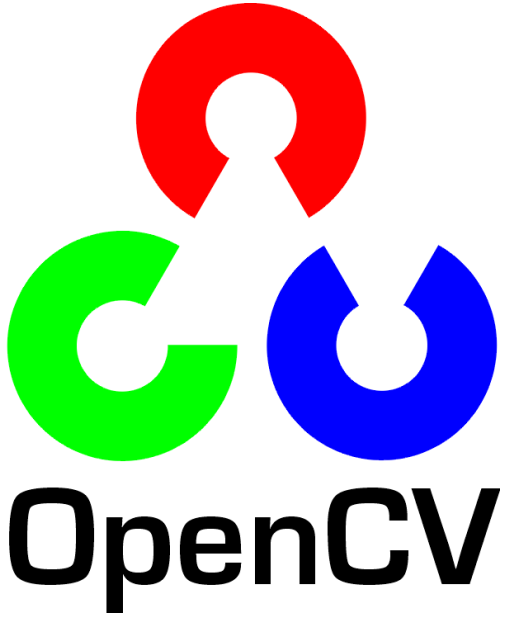
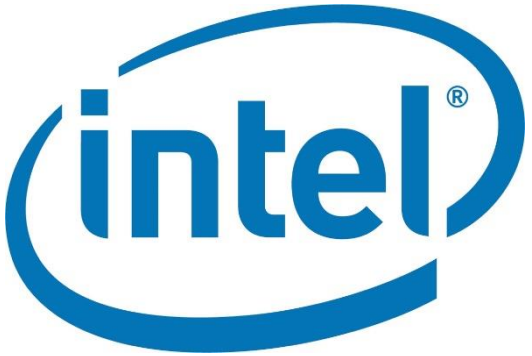
- OpenCV is an Image Processing library created by Intel and maintained by Willow Garage.
- Available for C, C++, and Python
- Newest update is version 4.5.3
- Open Source and free
- Easy to use and install





OpenCV – Deep Learning model process

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input

Face Detector

output

(x1, y1)
(x2, y2)

drawing

input

Face Recognizer

output

"Park Jisung"

OpenCV – Image

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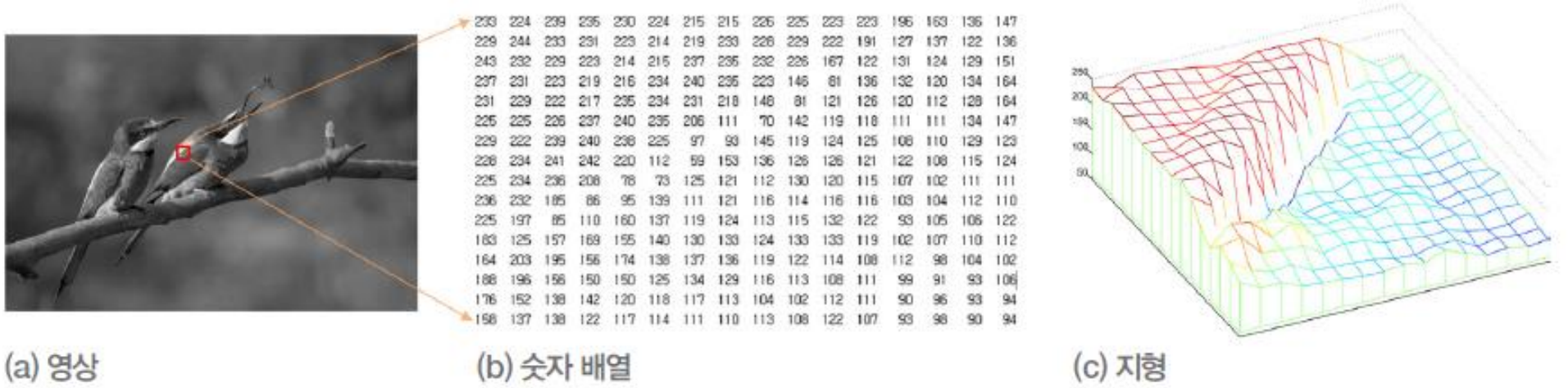
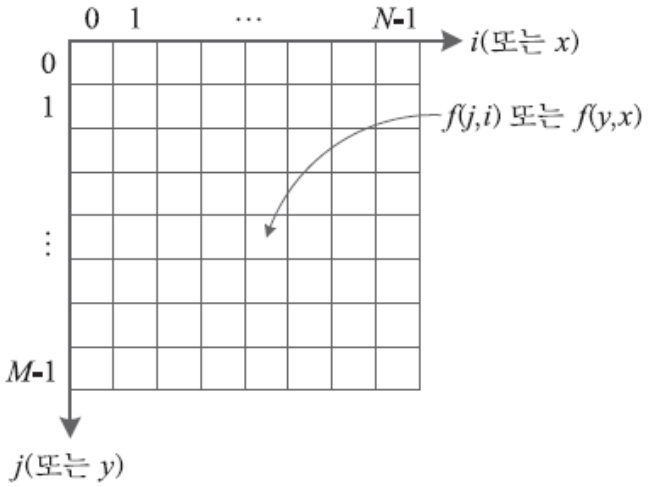
영상 좌표계

uint8





- 화소 위치 : x=(j,i) 또는 x=(y,x)로 표기
- 흑백 영상 : f(y, x) 또는 f(j,i), 0 ≤ j ≤ M-1, 0 ≤ j ≤ N-1로 표기
- 컬러 영상 : fr(x), fg(x), fb(x)의 세 채널로 구성

OpenCV – Image

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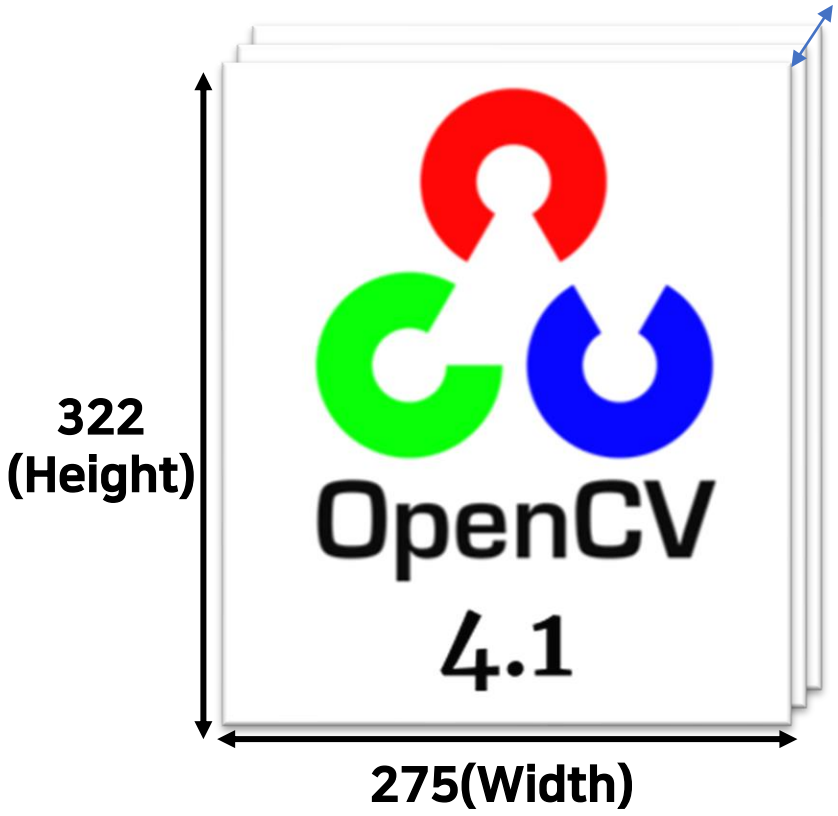
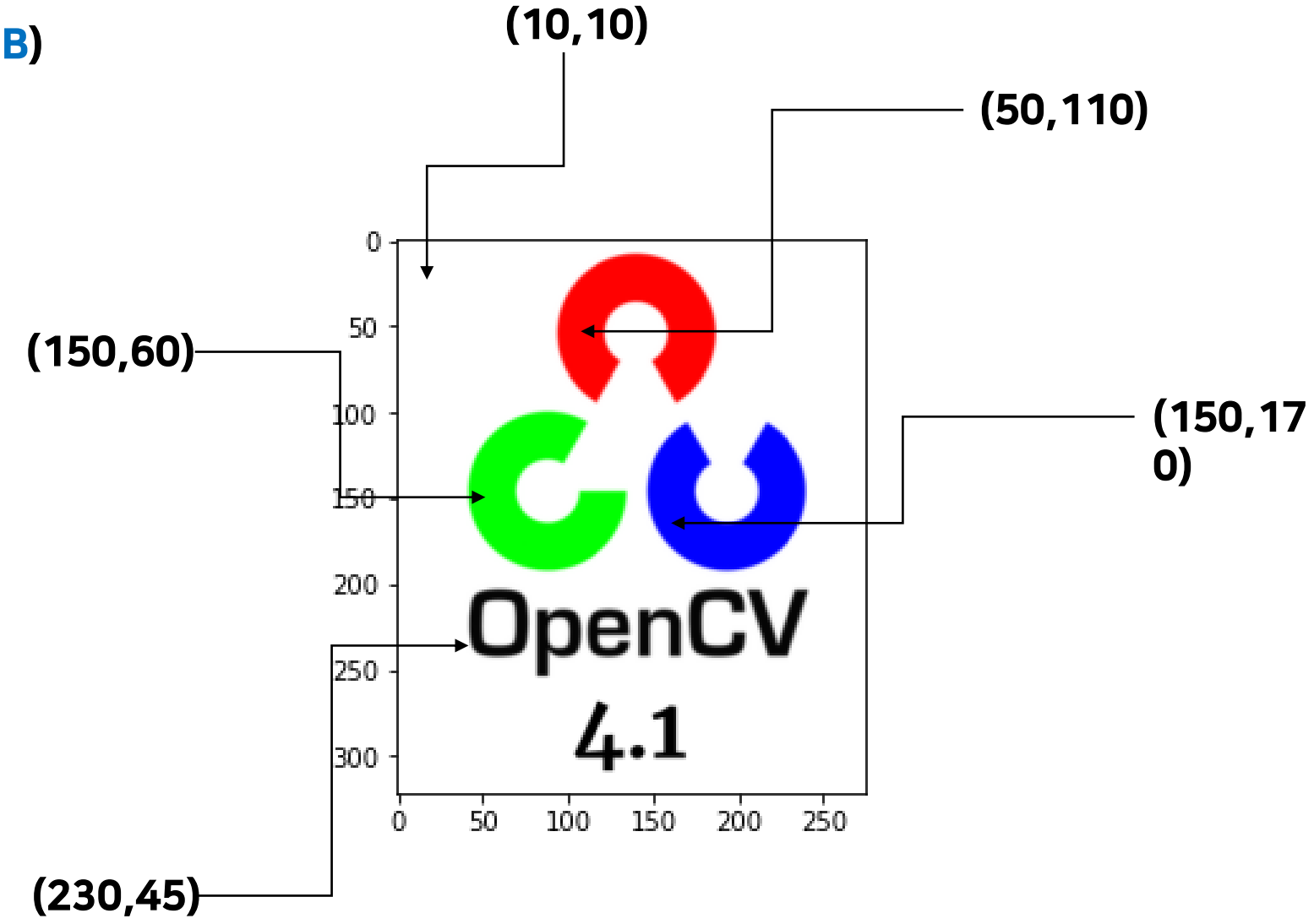



```
img.shape
```

```
(322, 275, 3)
```



OpenCV – Image Color

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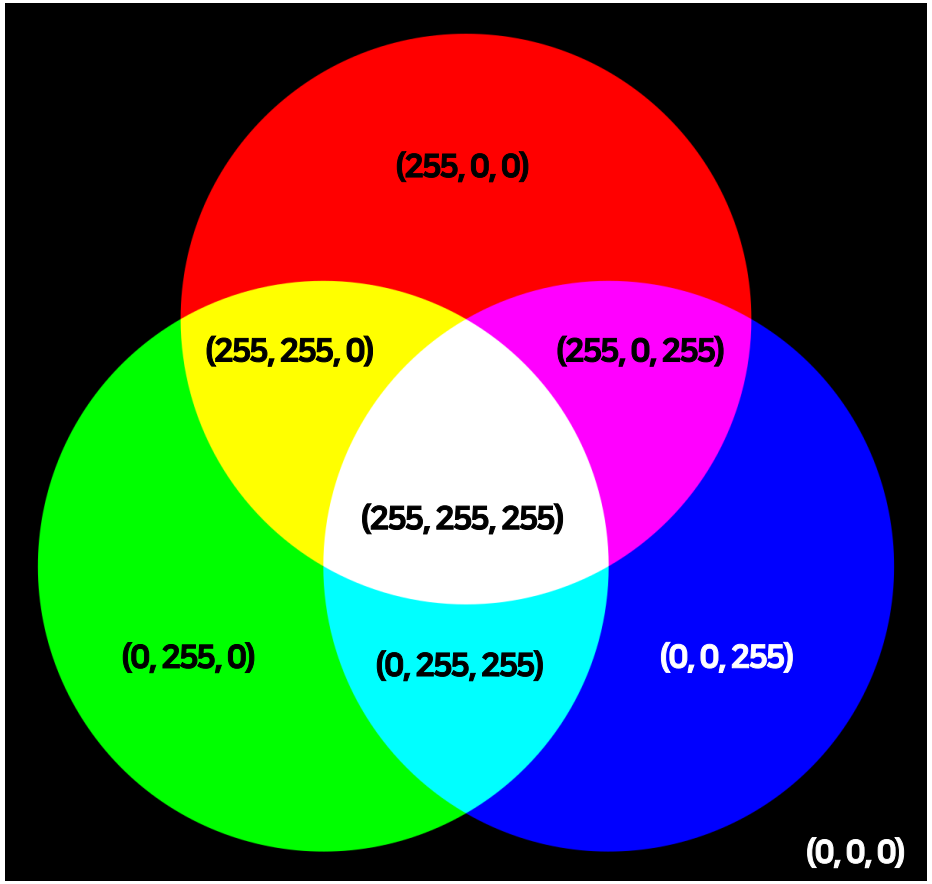

OpenCV – Color Space

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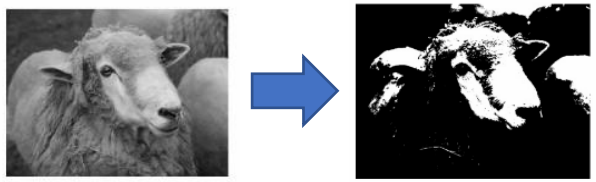
Color Image

R : [0 ~ 255]
G : [0 ~ 255]
B : [0 ~ 255]

Grayscale Image

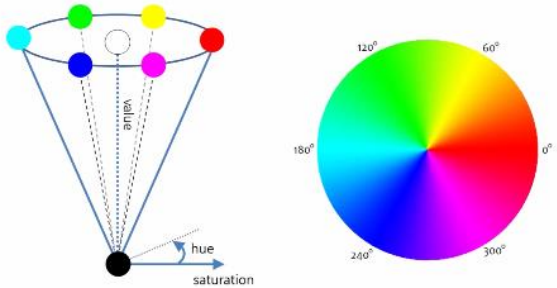
intensity : [0 ~ 255]

Binary Image



intensity : [0, 1]

HSV Image



Hue : [0 ~360]
Saturation : [0 ~ 255]
Value : [0 ~ 255]

OpenCV - Image Processing

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- 주어진 목적을 달성하기 위해 원래 영상을 새로운 영상으로 변환
- 컴퓨터 비전의 전처리 과정

(a) 원래 영상

(b) 어둡게

(c) 블러링

(d) 회전

Thresholding

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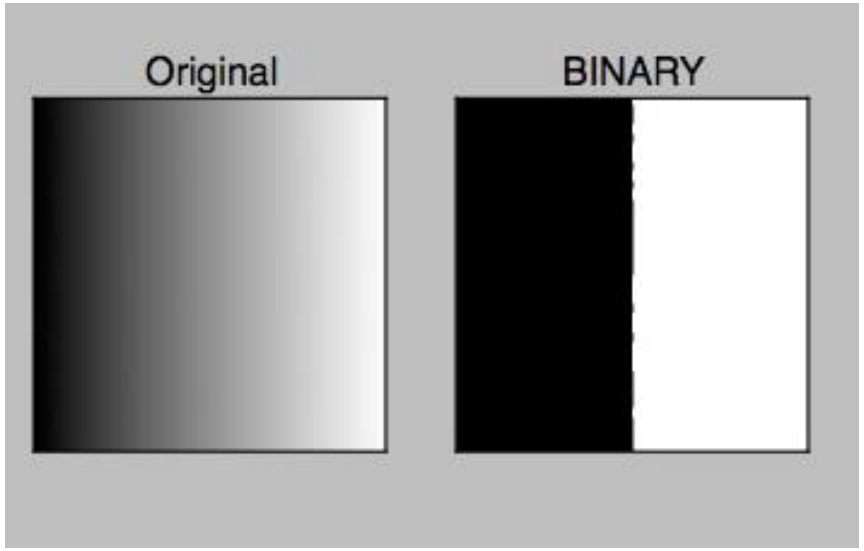
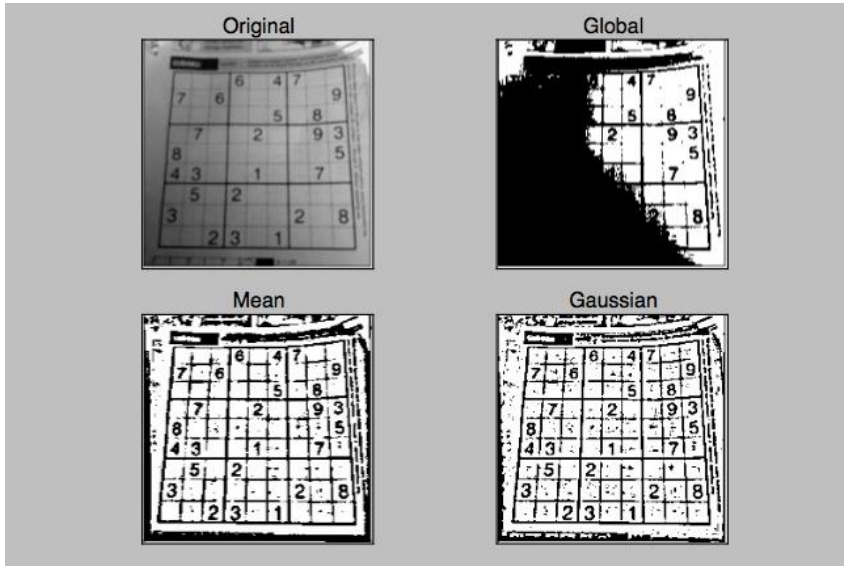
Threshold



Adaptive Threshold



Otsu binarization

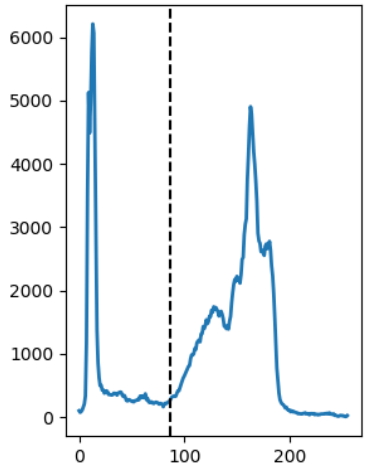


Image Filtering

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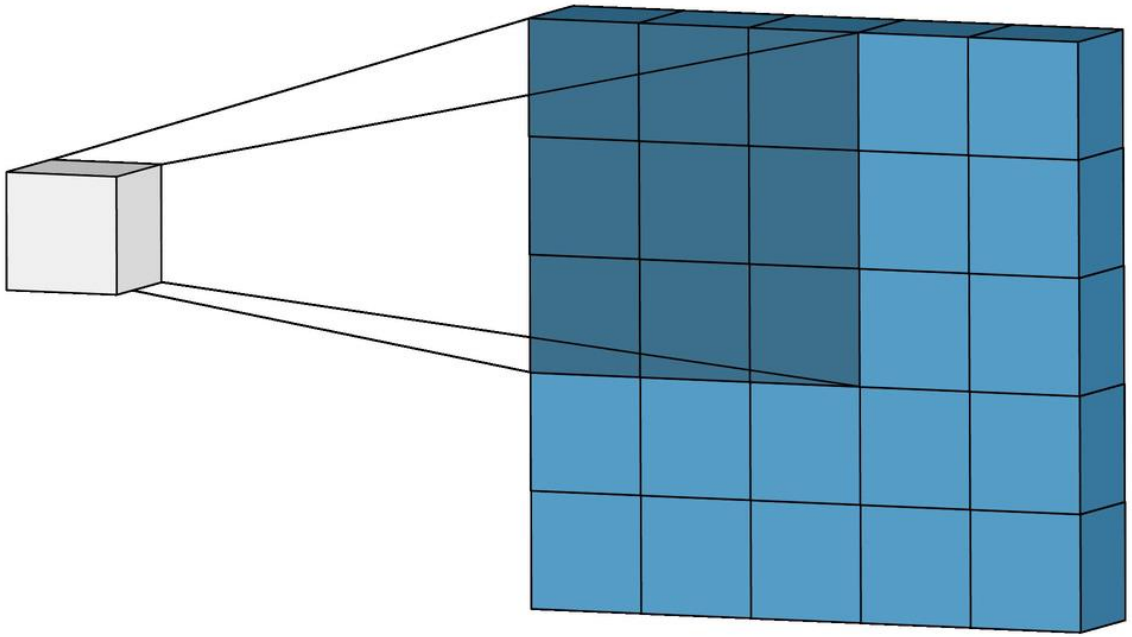

cv2.filter2D()

Image Courtesy of MIT

Original Image

Motion Blurred Image

Blurred Image

Sharpened Image

Image Filtering

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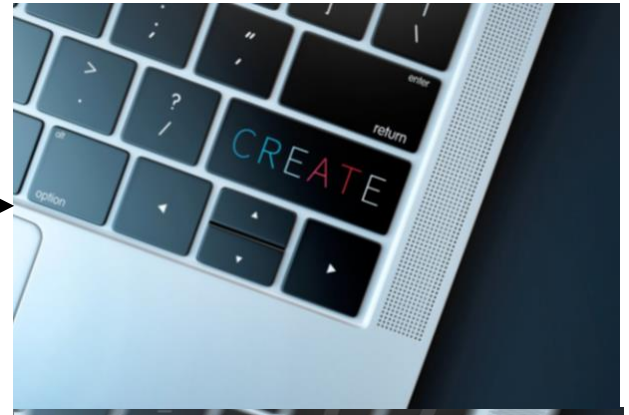
$$\frac{1}{9}\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$$

Blurring



$$\begin{bmatrix}0 & 0 & 0\\ 1 & 1 & 1\\ 0 & 0 & 0\end{bmatrix}$$

Motion blur

$$\begin{bmatrix}-1 & -1 & -1\\ -1 & 9 & -1\\ -1 & -1 & -1\end{bmatrix}$$

Sharpening

CNN & Image Filtering

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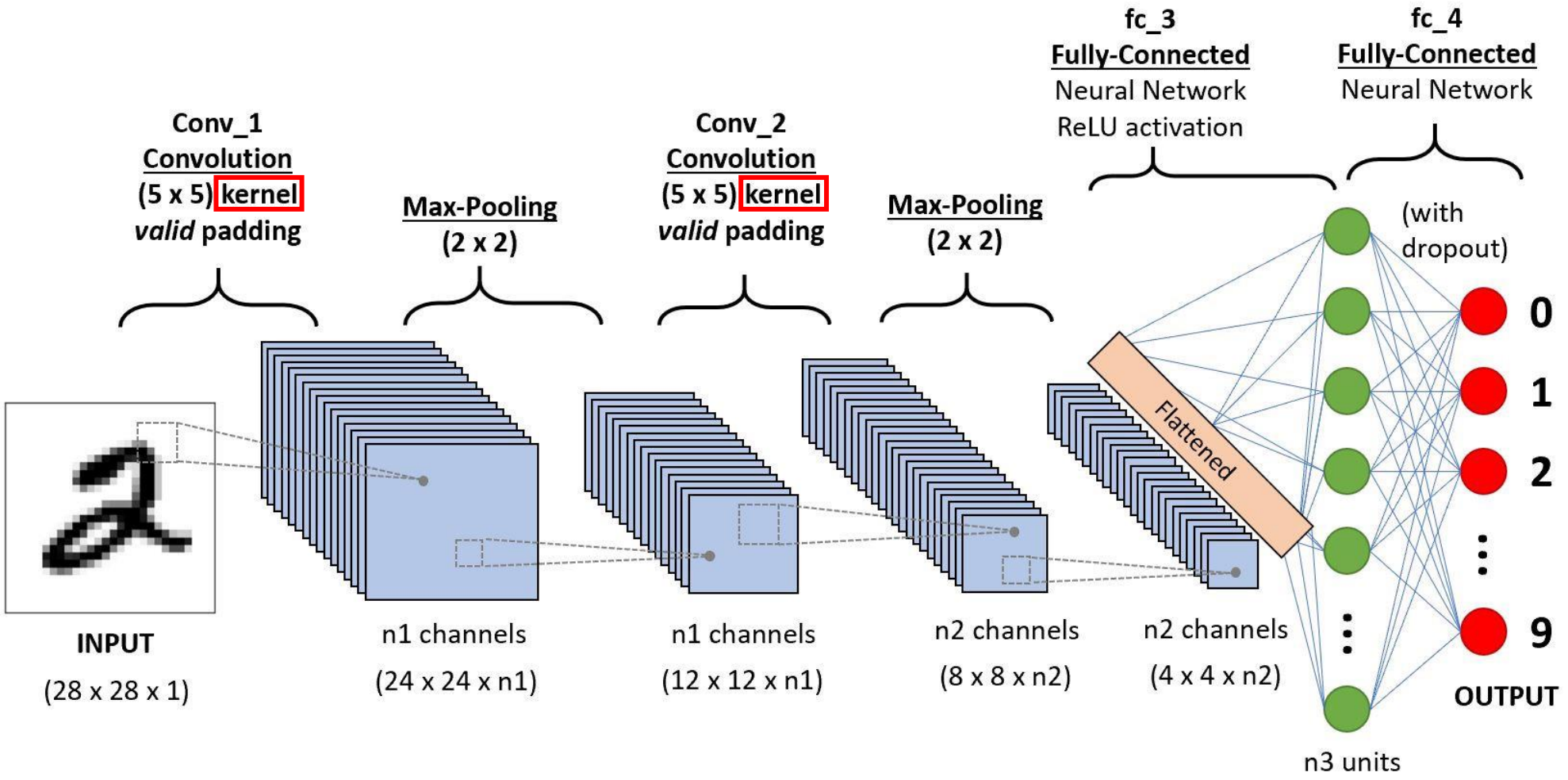

OpenCV - Video

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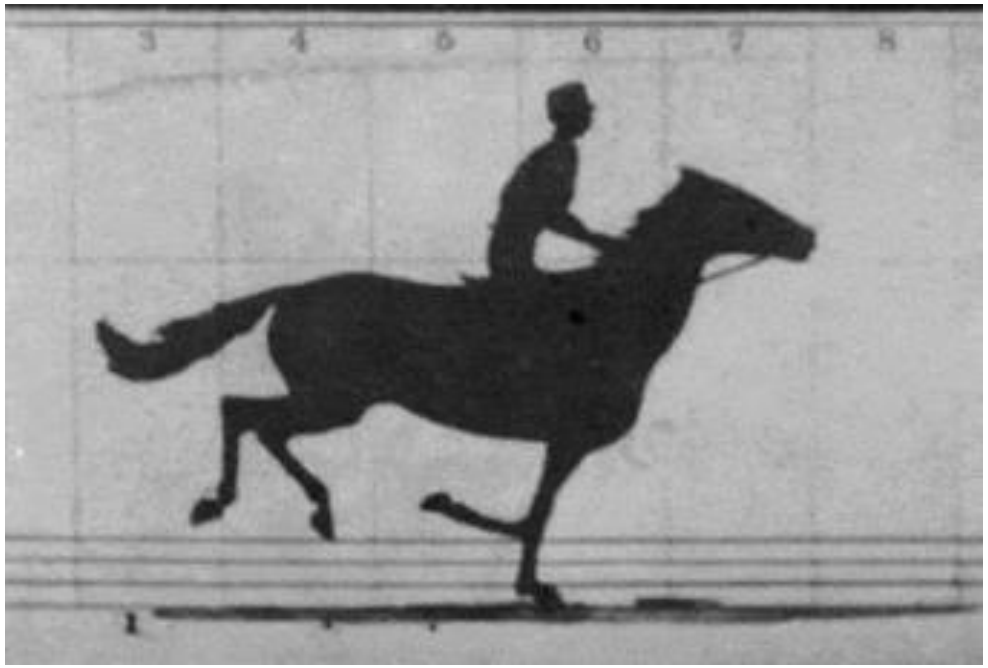

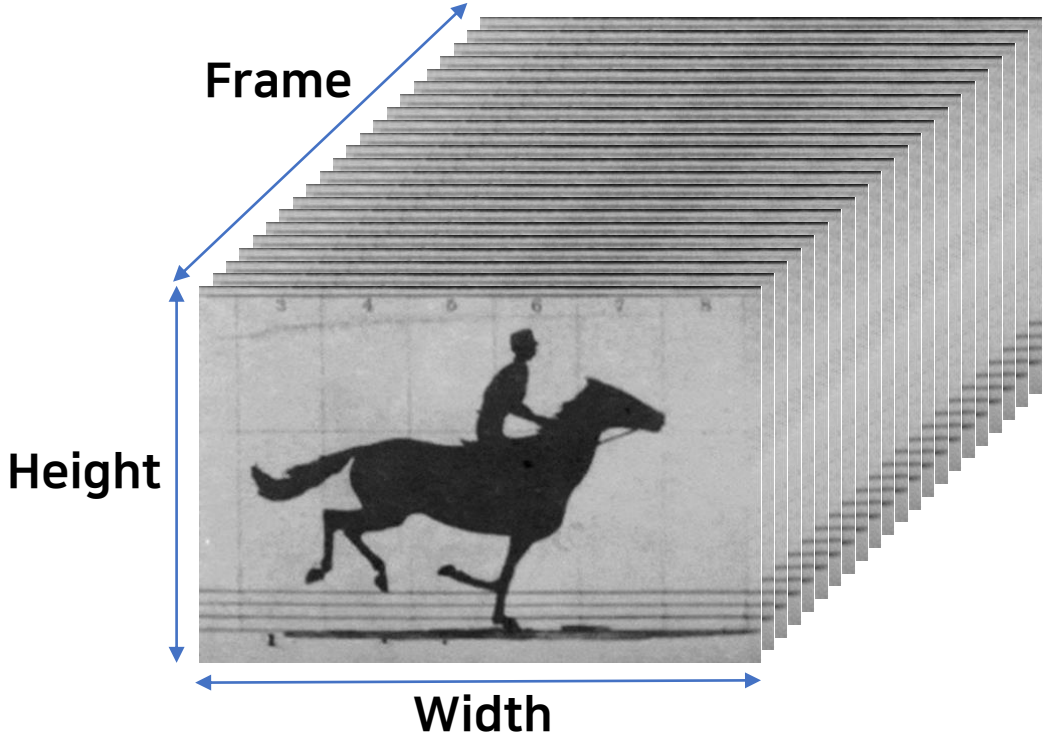

(Frame, Height, Width, (Channel))

- Fps(Frames per second) : 초당 재생되는 프레임 수
- Codec : 이미지를 효율적으로 저장하기 위해 영상/음성을 압축해 저장하거나, 압축된 영상/음성을 푸는 소프트웨어

Code Running